

## REMARKS

Claims 1-9 were pending and under consideration. In the Office Action of February 7, 2003, claims 1-9 were rejected.

In response, claim 1 has been amended and claims 6, 7, and 9 has been cancelled. ✓

The Examiner has rejected claims 1-5 and 7-9 under 35 U.S.C. § 103(a) as being unpatentable over Watanabe et al. (JP 08-306646A) in view of Ghandhi, "VLSI Fabrication Principles". The Examiner also has rejected claim 6 under 35 U.S.C. § 103(a) as being unpatentable over Watanabe et al. (JP 08-306646A) in view of Ghandhi, "VLSI Fabrication Principles" and further in view of Doan et al. (U.S. Patent No.: 5,767,005). The Examiner has essentially alleged that cited references teach what is disclosed and claimed in the present invention. Applicants respectfully disagree and traverse this rejection.

Independent claim 1, claims a method of manufacturing a semiconductor device by forming a semiconductor film substrate and then growing spherical or hemispherical grains on the surface of the film, diffusing an impurity to the grains grown on the surface of the semiconductor film, removing the impurity by hot water and then removing native oxide on the semiconductor film by a mixture of hydrofluoric acid (HF) and deionized water. This is clearly unlike all of the cited references, which fail to disclose or even suggest a step to remove native oxide on the semiconductor film after removing impurity by hot water.

In stark contrast, Watanabe et al. specifically discloses forming a semiconductor film on a substrate then growing polycrystallized grains on the surface and diffusing an impurity, but fails to disclose removing of impurity product, as the Examiner noted. Also, while Ghandhi discloses cleaning a semiconductor film using mixture of HF and deionized water; it does not, however, disclose or teach that this step should be done after washing with hot water. Finally, claim 6 has been cancelled which renders the rejection over Doan et al. moot.

Thus, unlike Applicants' claim 1, the cited references fail to disclose or fairly suggest a step of removing native oxide on the semiconductor film after the step of removing the impurity product by hot water.

The Examiner states that with respect to the temperature of the water, it would not be patentable unless there is showing of unexpected results. However, referring to Figure 8 of the present application, therein is a chart illustrating such results wherein the number of defects in the surface of a wafer, which represent the impurity on a semiconductor film with spherical or hemispherical grains, are charted against use of hot water and a conventional method as taught in Ghandhi. The number of defects in the case where hot water is used is largely less than those in the conventional cleaning method as described in Ghandhi. This reduction in defects allows any short circuit between the bottom electrodes in the capacitor formed adjacent to each other to be suppressed as much as possible and a capacitor with high reliability can be fabricated.

Another unexpected result is shown in Figure 9, wherein variance in water temperature is charted against the efficiency of the removal of impurity. Figure 9 shows that particle removal efficiency increases in accordance with the increase in the temperature of deionized water and the optimal temperature should be within the range of 30°C to 80°C. Clearly, using hot water to remove impurity on a semiconductor film before removing nitride oxide creates the unexpected results of a more efficient semiconductor.

Accordingly, it would not have been obvious to one skilled in the art at the time when the invention was made to combine the references as suggested by the Examiner to derive what is recited in claim 1.

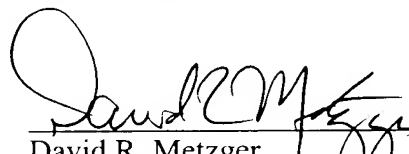
Claims 2-5 and 8 all depend directly from claim 1 and are therefore allowable for at least the same reason that claim 1 is allowable.

Applicants respectfully submit these rejections have been overcome and request that they be withdrawn.

In view of the foregoing, it is submitted that the pending claims 1-5 and 8 are patentable and that the application is in condition for allowance. Notice to that effect is respectfully requested.

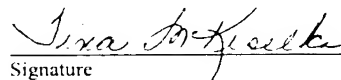
Respectfully submitted,

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